MEMORANDUM

DATE: April 20, 2006

TO: Lina Klein, Environmental Engineer
Construction Unit, Permit Section

THROUGH: Kyra L. Moore, Section Chief
Permit Section

FROM: Dawn Froning, Environmental Specialist IV
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SUBJECT: Ambient Air Quality Impact Analysis (AAQIA) for The Continental Cement Company-Prevention of Significant Deterioration (PSD) Modeling—01/24/06 Submittal

I. Introduction

On January 24, 2006 the Departments' Air Pollution Control Program received an AAQIA, in conjunction with the PSD permit application, for the Continental Cement Company, from STS Consultants, the firm representing the company. The document entitled "Air Construction Permit Application-Continental Cement Company, Ltd." was submitted in support of the proposed modification to the existing facility located in Hannibal, Missouri.

The Class II portion of the AAQIA has undergone various updates since the receipt of the original January submittal and the results contained within the text of this document were obtained at varying times throughout the history of this project. Although specific dates are not identified, supporting documentation can be found within the modeling files maintained by staff.

The following paragraphs describe the scope of the proposed project and the methodology used throughout the modeling study to show attainment of the appropriate National Ambient Air Quality Standards (NAAQS) and PSD increments. Any updates made to the model input file by the Air Quality Modeling Unit are described in detail within the body of this document.

Facility Description

Continental Cement is proposing to construct and operate a new Portland cement plant at its existing facility located in Hannibal, Missouri. Facility projections indicate that 3,300 tons of clinker will be produced on a daily basis at this location where raw materials for the production of cement will be obtained from both on- and off-site sources. On-site emission sources include those associated with a new underground quarry, raw material crushing, raw material milling, fuel storage, kiln operations, product milling, product storage, and material loading and unloading.

Limestone needed for the production of Portland cement will be obtained from a new underground quarry that will replace the existing surface quarry. Because the construction of the underground mine will take several years to complete, Continental Cement is proposing to obtain limestone from off-site quarries located within the surrounding counties. The primary limestone provider will be the Saverton Quarry located to the southeast of the property owned by Continental Cement. Continental Cement has purchased this quarry and has included all emission sources from the operations at Saverton in the AAQIA.

Other raw materials used in the mill mix will be obtained from other off-site sources. The raw materials will be prepared for use in the preheater tower by primary and secondary crushing, screening, blending, and grinding in raw mills located at the kiln site.

The proposed preheater/precalciner kiln will burn coal, petroleum coke, solid hazardous waste derived fuel, liquid hazardous waste derived fuel, non-hazardous waste materials, synthetic gas, and natural gas (during start-up and interruption only). All of the kiln fuels will be delivered from off-site sources and will be stored at the plant site until needed.

A preheater tower will be constructed adjacent to the cement kiln where exhaust gases from the precalciner and the cement kiln will be used to dry kiln feed in the preheater and raw mills. Recycled combustion air as described above is often termed tertiary air. The cement kiln itself is classified as a horizontal rotary kiln and will replace the existing kiln that is currently in use.

The cooled clinker from the kiln operations will be blended with gypsum and other additives prior to being ground in a finishing mill to form the finished product, Portland cement. The cement will be loaded on-site for distribution to customers.

It should be noted that the following equipment will be rendered inoperable upon the start-up of the new cement kiln: above ground limestone quarry, secondary crushing system, slurry storage tanks, the existing cement kiln, ESP, stack and clinker cooler.

II. Model Selection

The modeling procedures utilized in this study follow current air quality modeling guidelines. Version three of the Industrial Source Complex Short Term (ISCST3) dispersion model dated 02035 was used to evaluate the 1-hour, 3-hour, 8-hour, 24-hour, and annual impacts of carbon monoxide (CO), particulate matter less than ten microns in diameter (PM_{10}), and sulfur dioxide (SO_2) resulting from the operations at Continental Cement.

The ISCST3 is a U.S. Environmental Protection Agency (EPA) approved model based upon the Gaussian plume equation and can be used to model point, area, volume, and open pit sources. The model allows for the input of multiple sources, terrain elevations, structure effects, various grid receptors, wet and dry depletion calculations, urban or rural terrain, and averaging periods ranging from one hour to one year.

III. Source Data

CO, SO_2 and PM_{10} emissions will be generated from the operation of the cement kiln and the coal mill. Additional PM_{10} emission releases will occur from various operations at the facility, including, haul roads, storage piles, and process support systems such as conveyors, screens, etc. It is important to note that the emission calculations submitted with the permit application have undergone significant revisions. All emission estimates should be obtained from the permit file that is maintained by the Department's Air Pollution Control Program.

Because emission releases vary in nature, they can be classified as point, area, open-pit, or volume sources, in the ISCST3 dispersion model. The following paragraphs describe the emission classifications used in the AAQIA for Continental Cement.

Point Source Emissions

The document entitled "Users Guide for the Industrial Source Complex Dispersion Models" states that the point source algorithm should be used to model emission releases from stacks and isolated vents. Appendix A, Table 1, entitled "Continental Cement Hannibal, Missouri-Emission Rates and Stack Parameters," outlines the point source emissions and their associated stack parameters based upon information provided by STS Consultants and the permit engineer reviewing the project.

Please note, the original permit application dated January 24, 2006 indicated that emissions from the coal mill and the coal mill preheater would be vented through an independent stack located adjacent to the kiln stack. Staff noted during the review process that the SO_2 impact from this source exceeded the preconstruction monitoring thresholds outlined in 10 CSR 10-6.020 (3)(B) Table 2. Because preconstruction monitoring for SO_2 was not conducted, Continental Cement revisited the plant design and opted to vent the coal mill and coal mill preheater emissions through the main stack rather than an independent stack thereby reducing ambient SO_2 concentrations.

In addition, several stacks at the facility vent horizontally or are equipped with rain caps. In these instances, the restriction of vertical flow was accounted for by reducing the exit velocity of the pollutant stream to 0.001 meters per second in the model input file.

Volume Source Emissions

Several emission releases at the facility will not be vented through stacks. These fugitive dust emissions were classified as volume sources with the exception of haul roads and storage piles. The ISCST3 users guide states that "The ISC volume source algorithms are used to model releases from a variety of industrial sources, such as building roof monitors, multiple vents, and conveyor belts." Appendix A, Table 2 entitled "Continental Cement Hannibal, Missouri-Volume Source Emission Rates and Release Parameters" outlines the volume source emission rates and their associated parameters based upon the final plant design.

The Department's Air Pollution Control Program evaluated the dimensions of the volume source releases and concluded that the assignment of the release parameters was acceptable. Emission releases, vented inside enclosed structures without a stack, including storage piles, were characterized as volume sources with release parameters equivalent to the size of any openings that would allow for the escape of fugitive emissions. The scaling factors applied to the vertical and lateral dimensions were based upon the assumption that the emission release was an isolated volume source.

Area Source Emissions

Due to differences in the area and volume source algorithms, it has been determined that the area source algorithm best represents what is occurring when a truck passes over a haul road and/or the activities associated with storage piles. The decision to model haul road emissions as an area source, is acceptable based upon the ISCST3 users guide which states that, "area source algorithms can be used to model low level or ground level releases with no plume rise." The guidance goes on to state that an initial vertical dimension can be included in the area source input card to account for "…mechanically generated emission sources, such as mobile sources. In these cases, the emissions may be turbulently mixed near the source by the process that is generating the emissions, and therefore occupy some initial depth." Appendix A, Table 3 entitled "Continental Cement Hannibal, Missouri-Area Source Emission Rates and Release Parameters" outlines the area source emission rates and their associated parameters as contained in the model input file. Currently, the Department's Air Pollution Control Program limits the initial vertical dimension of the haul road emissions by the height of the haul road truck. If the height of the haul road truck is not known, a default value of 1.3953 can be substituted for the initial vertical dimension, which accounts for turbulent mixing at the surface. This assumes a truck height of three meters.

Due to model limitations, the ISCST3 dispersion model does not allow the user to characterize haul roads as a single emission source, so they must be modeled as several small sources. In order to determine the emission rate for each haul road, one must combine the individual emission rates. Please note that the emission rate contained in the model-input file is divided by the area of the source.

Emission Reductions

The Department's Air Pollution Control Program will allow Continental Cement to take advantage of emission reductions due to the closure of the above ground quarry, and the removal of the secondary crushing system, the slurry storage tanks, the existing cement kiln, the ESP, and the existing clinker cooler. All reductions were modeled based upon the actual physical dimensions of the equipment being utilized during normal operations at this time. All reductions were included in the determination of the significant impact area and increment compliance. It should be noted that negative emission rates were not included in the NAAQS compliance determination because compliance with the health standards must be based upon the potential emissions from the facility and surrounding sources. Appendix A, Table 4 entitled "Continental Cement Hannibal, Missouri-Emission Reductions" summarizes the emission releases that will experience reductions due to removal, control, or voluntary restriction. The facility will be required to reduce emissions through the installation of control equipment, reduced operating levels, or equipment removal. If Continental Cement fails to abide by the emissions reductions noted in Table 4, the results obtained from the AAQIA will not be considered valid.

In the past, the EPA Region VII has raised concerns regarding the treatment of source impacts in intermediate terrain when emission reductions are placed in the ISCST3 model. A review of the source code used in the execution of the model indicates that the least negative impact is used to determine the overall concentration during the summation of source impacts on a receptor by receptor basis. As such, the results obtained from the ISCST3 model should be a conservative estimate of source impacts with the worst case conditions being reported. Given this conservatism the Department's Air Pollution Control Program is comfortable with the results obtained during this model exercise.

Variable Emission Rates/Modeled Emission Limits

In addition to allowing the user to define sources as point, area, or volume sources, the ISCST3 model will also accept variable emission rate factors. For example, the user may want to specify that emissions from a haul road only occur for eight hours during a twenty-four hour period. This can be accomplished using the hour of day statement in the model input file. The hour of day limitation was applied to all of the sources at the Saverton Quarry located to the southeast of Continental Cement. Based upon the model input file, all of the source emissions will be limited to seventeen hours per day. Appendix A, Table 5 entitled "Continental Cement Hannibal, Missouri-Hourly Limitations" summarizes the emission points, and their location, that have operating restrictions based upon the number of hours per day that they can operate. If Continental Cement fails to abide by the hourly limitations contained within Table 5, the results obtained from the AAQIA will not be considered valid.

Release Locations

Continental Cement is located to the south of Hannibal on Highway 79 in Ralls County, Missouri. All of the emission releases associated with the modification to the existing facility are displayed in Appendix A, Figure 1 entitled "Continental Cement Hannibal, Missouri-Source Locations". Individual views of Continental Cement and the Saverton Quarry are displayed in Figure's 2 and 3 entitled, "Continental Cement Hannibal, Missouri-Continental Cement Source Locations" and "Continental Cement Hannibal, Missouri-Saverton Quarry Source Locations."

Because various materials are received from off-site sources, Continental Cement has several haul road emission points that travel along identical haul road routes. Figure 4 entitled "Continental Cement Hannibal, Missouri-Haul Road Routes" depicts that haul road segments as declared in the model input file.

IV. Receptors

STS Consultants implemented a Cartesian grid with variable spacing to determine the area of maximum impact from the proposed modification at Continental Cement. Along the property boundary, receptors were placed at 50-meter intervals. The remainder of the grid consisted of variable grid spacing from 100- to 1000-meters. An evaluation of the various receptor grids revealed that they are sufficient to determine the extent of Continental Cement's maximum impact. Appendix B, Figure 1 entitled "Continental Cement Hannibal, Missouri-Receptor Grid" graphically displays the receptor grid utilized in the AAQIA dated January 24, 2006.

In addition to determining the adequacy of the receptor grid spatially, an evaluation of terrain heights was conducted to ensure that the elevations contained in the model input reflect actual terrain features. Two quality assurance checks were conducted by staff from the Department's Air Pollution Control Program. Initially, receptor elevations for the receptor grid were obtained using the EPA's terrain processor, AERMAP. All elevations were based upon data contained in 7.5 minute topographic maps. These elevations were compared to those contained in the model file submitted by STS Consultants, no alterations were made to the terrain file. Appendix B, Figure's 2 and 3 entitled "Continental Cement Hannibal, Missouri-Modeled Terrain Elevations" and "Continental Cement Hannibal, Missouri-Local Topography" graphically displays the relief of the terrain near the source based upon the model evaluation and the topography located near the facility. Higher elevations and bluffs are apparent along the Mississippi River basin, with lower elevations within the flood plains. Ground level elevations range from 274 meters to 135 meters.

Finally, the EPA requires applicants to consider all unfenced areas as ambient air regardless of the location of the facility's actual property line. The boundary declared in the Continental Cement modeling analysis, displayed in Appendix B, Figure 4 entitled "Continental Cement Hannibal, Missouri-Property Boundary", must be fenced in a manner that prohibits entrance by unauthorized individuals. Failure to fence the property boundary as it was declared in the air quality analysis could result in inaccurate model results.

V. Meteorological Data

Five years of meteorological data were used and included the following years: 2000, 2001, 2002, 2003, and 2004. The meteorological data files were developed using surface and upper air data collected at the National Weather Service station located at Lambert International Airport and Lincoln, Illinois. The files were processed using the most current version of PCRAMMET.

VI. Building Downwash

Building downwash was calculated using the Building Profile Input Program (BPIP). The information needed to execute BPIP are the heights and locations of structures, which may contribute to building downwash, and the stack locations in relation to these structures.

Once the stack and building configuration is determined, BPIP performs two basic functions. The first function of the program is to determine if a stack is being subjected to wake effects from a surrounding structure or structures. If structure wake effects are evident, flags are set to indicate which stacks are affected by building wake zones. Once it is determined that a stack is influenced by a structure BPIP will execute the second primary function of the program. This function calculates the building heights and widths to be included in the dispersion model so that building downwash effects can be considered.

In order to determine if the building downwash calculations were applied correctly, the coordinates of each building corner are needed. Appendix C, Figure 1 entitled "Continental Cement Hannibal, Missouri-Building Configuration" depicts the proposed building configuration that will exist upon the completion of the modification.

In some instances, building cavity wake zones will extend off a facility's property. Due to inherent model limitations, the ISCST3 does not calculate concentrations for receptors that fall within this zone of influence. Because this could potentially impact the final results of the model output, the Department's Air Pollution Control Program requires a wake cavity evaluation using the EPA's SCREEN3 model and the Schulman-Scire wake cavity algorithms for all receptors the ISCST3 locates within off property cavities.

It is important to note that the ISCST3 model does not identify the actual location of the building, but determines the extent of the cavity wake zone by comparing the receptor/stack configuration to $3*h_b$ for tall buildings, where h_b is the building height, or $3*h_w$ for squat buildings, where h_w is the projected width of the building. In reality the receptor location may or may not fall within the actual recirculation zone.

The ISCST3 results identified twenty-two source/receptor combinations that could potentially fall within the recirculation zone of the following buildings: Pack House, River Silo #1 and River Silo #2 refer to Appendix C, Table 1, entitled "Continental Cement Hannibal, Missouri Source Receptor Combinations for Which No Calculations Were Made Due to Cavity Wake Zone. The location of each receptor in relation to the stack is graphically displayed in Appendix C, Figure 2, entitled "Continental Cement Cavity Wake Zone Receptors vs. Facility Layout".

In order to address ambient concentrations within the cavity wake zone, SCREEN3 was executed using the Schulman-Scire building downwash/cavity option. The SCREEN3 model output includes an evaluation of the recirculation zone and the meteorological conditions needed to develop such a zone. If it is determined that a cavity wake zone exists, the model will output the maximum concentration predicted to occur within this zone based upon the worst case wind speed and stability. In addition to the cavity wake zone concentrations, the output from the SCREEN3 model includes the maximum concentration predicted to occur based upon the distance from the stack to the receptor. The results of the screening analysis are summarized in Sections IX, XII and XIII.

VII. Good Engineering Practice Stack Height

The Clean Air Act states that a stack should be high enough to ensure that its emissions do not result in excessive ground level pollutant concentrations in the area surrounding the stack due to downwash effects caused by the source itself, nearby structures, or complex terrain. It also states that the stack shall not exceed two and one-half times the height of the obstructing source unless a demonstration can be made that this is necessary. According to 40 CFR 51,l(ii), good engineering practice (GEP) stack height is the greater of 65 meters (measured from base of the stack) or the height of the nearby structure (measured from base of stack) plus 1.5 times the lesser dimension of the nearby structure. If neither of the above approaches are used to determine GEP stack height, a fluid model study can be conducted.

Several of the stacks contained within the model input file exceed 65 meters. Nearby structures must be evaluated to determine if the stack height used in the model analysis meets GEP stack height requirements. The kiln stack will be the tallest stack constructed at the facility with a maximum height of 117.35 meters. The BPIP output computed GEP stack height for this stack at 138.87 meters. The output generated from the BPIP preprocessor is contained within Appendix D, Table 1 entitled "Continental Cement-Hannibal, Missouri GEP Stack Height". Based upon the model output, all of the proposed stacks met GEP stack height requirements.

VIII. Significance Determination

As stated earlier, a facility that proposes to emit any pollutant above the thresholds outlined in 10 CSR 10-6.060 (3)(A) Table 1 must submit an ambient air quality impact analysis to the permit granting authority. In order to determine if a full impact model analysis and/or ambient air monitoring is necessary, a facility must complete a preliminary model analysis. This analysis should only include the proposed source(s) or modification(s) so it can be determined if a significant modeled impact will take place. If the model predicts the high first high to be below the thresholds outlined in 10 CSR 10-6.060 (11)(D) Table 4, no further analysis is necessary and the modeling study can be deemed complete provided it follows the EPA's minimum modeling requirements.

The following paragraphs describe the results obtained from the verification analysis conducted by the Department's Air Pollution Control Program on a pollutant by pollutant basis.

CO

Appendix E, Table 1 entitled "Continental Cement Hannibal, Missouri-CO Significant Impact Determination," summarizes the high first high concentrations as predicted by the ISCST3 dispersion model for CO. The worst case 8-hour impacts occurred during the 2001 meteorological period with a maximum concentration of 58.76 $\mu g/m^3$. Likewise, the worst case 1-hour impacts occurred during the 2001 meteorological period with a maximum concentration of 194.46 $\mu g/m^3$. Both of these concentrations are below the significance levels of 500 $\mu g/m^3$ and 2000 $\mu g/m^3$ for the 8- and 1-hour averaging periods and as such no further analysis for this pollutant is necessary.

SO_2

Appendix E, Table 2 entitled "Continental Cement Hannibal, Missouri-SO_2 Significant Impact Determination," summarizes the high first high concentrations as predicted by the ISCST3 dispersion model for SO_2. The worst case 3-hour impacts occurred during the 2001 meteorological period with a maximum concentration of 61.38 $\mu g/m^3$. The worst case 24-hour impacts occurred during the 2004 meteorological period with a maximum concentration of 7.21 $\mu g/m^3$. Lastly, the worst case long term annual impact occurred during the 2003 meteorological period with a maximum concentration of 0.45 $\mu g/m^3$. The 3-hour and 24-hour averaging periods exceed the significance levels of 25 $\mu g/m^3$ and 5 $\mu g/m^3$, thereby triggering a full impact analysis for this pollutant.

The extent of each significant impact area is graphically displayed in Appendix E, Figure's 1 and 2, entitled, "Continental Cement Hannibal, Missouri-Significant Impact Area Determination, 3-Hour Averaging Period-SO_2" and "Continental Cement Hannibal, Missouri-Significant Impact Area Determination, 24-Hour Averaging Period-SO_2."

PM$_{10}$

Appendix E, Table 3 entitled "Continental Cement Hannibal, Missouri-PM$_{10}$ Significant Impact Determination," summarizes the high first high concentrations as predicted by the ISCST3 dispersion model for PM$_{10}$. The worst case 24-hour and annual impacts occurred during the 2004 meteorological period with maximum concentrations of 34.27 μg/m^3 and 3.44 μg/m^3. The 24-hour and annual averaging periods exceed the significance levels of 5 μg/m^3 and 1 μg/m^3, thereby triggering a full impact analysis for this pollutant.

The extent of each significant impact area is graphically displayed in Appendix E, Figure's 3 and 4, entitled, "Continental Cement Hannibal, Missouri-Significant Impact Area Determination, 24-Hour Averaging Period-PM$_{10}$" and "Continental Cement Hannibal, Missouri-Significant Impact Area Determination, Annual Averaging Period-PM$_{10}$."

As noted in Section VII, several stack/receptor combinations were flagged as locations where concentrations were not predicted due to the presence of a cavity wake zone based upon the algorithms contained within the ISCST3 dispersion model. Appendix E, Table 4 entitled "Continental Cement-Hannibal, Missouri PM$_{10}$ Cavity Wake Zone Evaluation" summarizes the results obtained from the SCREEN3 dispersion model. With the exception of SH5, all of the stacks/receptor combinations identified by the ISCST3 model fall outside the cavity zone calculated by the SCREEN3 model. SH5 is predicted to have a maximum 24-hour concentration of 17.72 μg/m^3 when the stack is on the downwind side of the building with flow along the shortest side of the building at receptor (644901, 4393499). In reviewing the stack/receptor configuration, if the flow is parallel to the short side of the building, the cavity would not overlap the receptor in question. Please refer to Appendix E, Figure 5 entitled "Continental Cement-Hannibal, Missouri Cavity Wake Zone Stack/Receptor Configuration". As such, the concentration predicted for the longest side of the building, 8.72 μg/m^3 was used for compliance purposes on a 24-hour basis. The concentration included in determining the annual impact is 1.744 μg/m^3.

For the remaining stack/receptor combinations, the results obtained from the screening model indicate that no additional ambient impact should be included at those receptors identified as located within a cavity wake zone as described by the ISCST3 dispersion model. This is because none of the receptors falls within the cavity predicted by the SCREEN3 model and the maximum concentration predicted at discrete receptors was 0 μg/m^3.

Preconstruction Ambient Air Quality Monitoring

Based upon the significant impact analysis, a minimum of one year of preconstruction monitoring data is required for PM$_{10}$. Continental Cement's preconstruction monitoring study is on going and commenced on May 4, 2005. Appendix E, Figure 6, entitled "Continental Cement Hannibal, Missouri-Preconstruction Monitoring Concentrations-PM$_{10}$", contains a graphical display of the PM$_{10}$ concentrations that were monitored near Continental Cement.

IX. NAAQS Inventory

In order to complete the full impact analysis, STS Consultants requested a NAAQS inventory for all facilities that could potentially impact the results obtained from the Continental Cement facility. The Guideline on Air Quality Models suggests that all nearby sources be included in this inventory. Currently, the Department's Air Pollution Control Program defines nearby as any facility within 50 kilometers of the proposed sources significant impact area.

The original interactive source inventory submitted to the contractor is contained in the modeling file for Continental Cement. All of the emission release points associated with the Continental Cement facility were provided by the permit engineer and forwarded to STS Consultants for inclusion into a revised NAAQS evaluation. Appendix F, Figure 1 entitled "Continental Cement Hannibal, Missouri-NAAQS Sources" contains a graphical display of the locations of the interactive sources contained within the AAQIA.

Occasionally erroneous data is contained in the emission inventories. The Department's Air Pollution Control Program and STS Consultants worked in conjunction with one another to determine appropriate emission rates for several questionable sources. An evaluation of the "final" interactive sources indicated that all alterations to the inventory were approved by staff employed by the Department's Air Pollution Control Program.

X. Increment Inventory

The Department's Air Pollution Control Program is required to review increment consumption based upon the baseline dates and areas established in Section 107 of the Clean Air Act until clean area redesignation requests are submitted to and approved by the EPA. Current data indicates that the particulate matter minor source baseline was triggered for the entire northern air quality control region in 1977. As such, the inventory for this pollutant included all sources within 50 kilometers of Continental Cement's significant impact area that have received a permit since 1977. An evaluation of the "final" interactive sources indicated that all emission releases provided in the original inventory were included in the increment evaluation.

The minor source baseline date for SO_2 has not been triggered in Ralls or Pike Counties. However, a portion of the property boundary extends into Marion County, Missouri, an area that has triggered the minor source baseline date, refer to Appendix G, Figure 1 entitled "Continental Cement Hannibal, Missouri-Baseline Area Review". As such, the increment analysis for SO_2 included all sources who received a permit since 1977.

XI. NAAQS Results

A NAAQS compliance demonstration is required for all pollutants that exceed the significance levels outlined in 10 CSR 6.060 (11)(D) Table 4. As stated previously, the significance level for SO_2 and PM_{10} was exceeded, thereby triggering a full impact analysis including an evaluation of compliance with the NAAQS. Unlike a significance determination, a NAAQS compliance demonstration must consider emissions from the proposed source and existing "interactive" sources that contribute to background pollutant concentrations. The modeled emission rates must reflect the maximum allowable operating conditions based upon federally enforceable emission limits and operating levels, for each pollutant, and averaging time.

The following paragraphs describe the results obtained from the verification analysis conducted by the Department's Air Pollution Control Program on a pollutant by pollutant basis.

SO_2

Appendix H, Table 1 entitled "Continental Cement Hannibal, Missouri-NAAQS Compliance Determination-SO_2" summarizes the high first high annual, and high second high 3-hour and 24-hour concentrations as predicted by the ISCST3 dispersion model for SO_2. The highest estimate must be used when determining annual SO_2 compliance because the standard is a long term deterministically based standard. For the short-term portion of the standard, the highest second highest model estimate is appropriate for compliance purposes.

The results indicate that several violations of the SO_2 standard would occur with a maximum 3-hour maximum concentration of 2327.41 $\mu g/m^3$. The worst case 24-hour and annual impacts occurred during the 2000 meteorological period with maximum concentrations of 518.35 and 45.16 $\mu g/m^3$ with a violation of the 24-hour standard being noted. All three concentrations include a background concentration of 68.00 $\mu g/m^3$, 52.3 $\mu g/m^3$, and 4.7 $\mu g/m^3$ for the 3-hour, 24-hour and annual averaging periods. The background concentrations account for the impact of natural sources, nearby sources not accounted for in the model analysis, and potential unidentified sources.

According to EPA guidance, Continental Cement must demonstrate that they do not have a significant impact at any violating receptor regardless of where it is located. If it can be demonstrated that Continental Cement has insignificant impacts at violating receptors (at the time of the predicted violation), approval of the SO_2 analysis can be provided. Appendix H, Tables 2 and 3, entitled "Continental Cement Hannibal, Missouri-SO_2 Exceedance Receptors vs. First High Impacts-3-Hour" and "Continental Cement Hannibal, Missouri-SO_2 Exceedance Receptors vs. First High Impacts-24-Hour" summarize the impact Continental Cement has on each receptor in violation of the SO_2 standard. On a 3- and 24-hour basis, Continental Cement did not have a significant impact at any violating receptors. As such, no further analysis is necessary for this averaging time.

The SO_2 output generated from the ISCST3 dispersion model is graphically in Appendix H, Figure's 1, 2, and 3 entitled, "Continental Cement Hannibal, Missouri-NAAQS Compliance, Annual Averaging Period-SO_2," "Continental Cement Hannibal, Missouri -NAAQS Compliance, 24-hour Averaging Period-SO_2," and "Continental Cement Hannibal, Missouri -NAAQS Compliance, 3-Hour Averaging Period-SO_2," respectively.

A large portion of the elevated SO_2 concentrations occurred to the north northwest of the Continental Cement facility in Marion County, Missouri. The maximum impacts appear to be the result of emissions from the existing BASF facility. A review of the model output indicates that a portion of the elevated concentrations may be occurring at onsite receptors.

PM_{10}

To show compliance with the NAAQS for PM_{10} the facility must demonstrate that its impact will be below 150 $\mu g/m^3$ on a 24-hour basis and 50 $\mu g/m^3$ on an annual basis. The basis for the development of the NAAQS should be used when comparing modeled concentrations to the above thresholds. For a statistically based standard, such as PM_{10}, the highest sixth-highest estimate for the short term standard, and the highest annual average estimate for the long term standard are used to determine compliance.

The results from the Department's Air Pollution Control Program verification run were used to evaluate compliance with the PM_{10} standards and are contained in Appendix H Table 4 entitled "Continental Cement Hannibal, Missouri-NAAQS Compliance Determination-PM_{10}." These results indicated that several violations of the PM_{10} standard would occur with a maximum annual concentration of 1050.713 $\mu g/m^3$ and a high sixth high 24-hour maximum of 9798.69 $\mu g/m^3$. All concentrations include a background concentration of 48.0 $\mu g/m^3$, and 15.0 $\mu g/m^3$ for the 24-hour and annual averaging periods. The background concentrations account for the impact of natural sources, nearby sources not accounted for in the model analysis, and potential unidentified sources.

According to EPA guidance, Continental Cement must demonstrate that they do not have a significant impact at any violating receptor regardless of where it is located. If it can be demonstrated that Continental Cement has insignificant impacts at violating receptors (at the time of the predicted violation), approval of the PM_{10} analysis can be provided. Appendix H, Tables 5 and 6, entitled "Continental Cement Hannibal, Missouri-PM_{10} Exceedance Receptors vs. First High Impacts-24-Hour" and "Continental Cement Hannibal, Missouri-PM_{10} Exceedance Receptors vs. First High Impacts-Annual" summarize the impact Continental Cement has on each receptor in violation of the PM_{10} standard. On an annual and 24-hour basis, Continental Cement did not have a significant impact at any violating receptors.

Additionally, as noted in Section VII, several stack/receptor combinations were flagged as locations where concentrations were not predicted due to the presence of a cavity wake zone based upon the algorithms contained within the ISCST3 dispersion model. Appendix E, Table 4 entitled "Continental Cement Hannibal, Missouri-PM_{10} Cavity Wake Zone Evaluation" summarizes the results obtained from the SCREEN3 dispersion model. With the exception of SH5, all of the stacks/receptor combinations identified by the ISCST3 model fall outside the cavity zone calculated by the SCREEN3 model. SH5 is predicted to have a maximum 24-hour concentration of 17.72 $\mu g/m^3$ when the stack is on the downwind side of the building with flow along the shortest side of the building at receptor (644901, 4393499). In reviewing the stack/receptor configuration, if the flow is parallel to the short side of the building, the cavity would not overlap the receptor in question. Please refer to Appendix E, Figure 5 entitled "Continental Cement Hannibal, Missouri-Cavity Wake Zone Stack/Receptor Configuration". As such, the concentration predicted for the longest side of the building, 21.8 $\mu g/m^3$ was used for compliance purposes on a 24-hour basis. The concentration included in determining the annual impact is 1.744 $\mu g/m^3$. Using the SCREEN3 output the maximum concentration predicted at receptor (644901, 4393499) is 94.39 $\mu g/m^3$ and 27.10 $\mu g/m^3$ on a 24-hour and annual basis.

For the remaining stack/receptor combinations, the results obtained from the screening model indicate that no additional ambient impact should be included at those receptors identified as located within a cavity wake zone as described by the ISCST3 dispersion model. This is because none of the receptors falls within the cavity predicted by the SCREEN3 model.

The PM_{10} output generated from the ISCST3 dispersion model is graphically in Appendix H, Figure's 4 and 5 entitled, "Continental Cement Hannibal, Missouri-NAAQS Compliance, Annual Averaging Period-PM_{10}" and "Continental Cement Hannibal, Missouri-NAAQS Compliance, 24-hour Averaging Period-PM_{10}."

Several areas with elevated PM_{10} concentrations are evident and occurred within the city limits of Hannibal, southwest, southeast and north northwest of the Continental Cement facility. The maximum impacts appear to be the result of emissions from existing sources. A review of the model output indicates that a portion of the elevated concentrations may be occurring at onsite receptors.

XII. Increment Consumption

As stated previously, SO_2 and PM_{10} are the only pollutants that triggered a full impact analysis based upon the net emissions increase that will occur at the Continental Cement facility. In addition to demonstrating compliance with the NAAQS for these pollutants, Continental Cement must demonstrate that they will not deteriorate the air quality beyond the limits outlined in 10 CSR 10-6-060 (11)(A) Table 1.

The Department's Air Pollution Control Program is required to review increment consumption based upon the baseline dates and areas established in Section 107 of the Clean Air Act until clean area redesignation requests are submitted to and approved by the EPA. Current data indicates that the particulate matter minor source baseline was triggered for the entire northern air quality control region in 1977. As such, the inventory for this pollutant included all sources within 50 kilometers of Continental Cement's significant impact area that have received a permit since 1977. An evaluation of the "final" interactive sources indicated that all emission releases provided in the original inventory were included in the increment evaluation.

The minor source baseline date for SO_2 has not been triggered in Ralls or Pike Counties. However, a portion of the property boundary extends into Marion County, Missouri, refer to Appendix G, Figure 1 entitled "Continental Cement-Hannibal, Missouri Baseline Area Review". This area has triggered the minor source baseline date and as such, the increment analysis for SO_2 included all sources that received a permit since 1977.

The following paragraphs describe the results obtained from the verification analysis conducted by the Department's Air Pollution Control Program on a pollutant by pollutant basis.

SO_2

Appendix I, Table 1 entitled "Continental Cement Hannibal, Missouri-Increment Compliance Determination-SO_2" summarizes the high first high annual, and high second high 3-hour and 24-hour concentrations as predicted by the ISCST3 dispersion model for SO_2. The highest estimate must be used when determining annual SO_2 compliance because the standard is a long term deterministically based standard. For the short-term portion of the standard, the highest second highest model estimate is appropriate for compliance purposes.

The results indicate that several violations of the SO_2 standard would occur with a maximum 3-hour maximum concentration of 732.03 $\mu g/m^3$. The worst case 24-hour and annual impacts occurred during the 2001 and 2003 meteorological periods with maximum concentrations of 137.64 and 15.99 $\mu g/m^3$ with a violation of the 24-hour standard being noted. All three concentrations include interactive source impacts for the 3-hour, 24-hour and annual averaging periods. The interactive sources account for the impact of expansion on air quality within the region.

According to EPA guidance, Continental Cement must demonstrate that they do not have a significant impact at any violating receptor regardless of where it is located. If it can be demonstrated that Continental Cement has insignificant impacts at violating receptors (at the time of the predicted violation), approval of the SO_2 analysis can be provided. Appendix I, Tables 2 and 3, entitled "Continental Cement Hannibal, Missouri-SO_2 Exceedance Receptors vs. First High Impacts-3-Hour" and "Continental Cement Hannibal, Missouri-SO_2 Exceedance Receptors vs. First High Impacts-24-Hour" summarize the impact Continental Cement has on each receptor in violation of the SO_2 standard. On a 3- and 24-hour basis, Continental Cement did not have a significant impact at any violating receptors. As such, no further analysis is necessary for this averaging time.

The SO_2 output generated from the ISCST3 dispersion model is graphically in Appendix I, Figure's 1, 2, and 3 entitled, "Continental Cement Hannibal, Missouri-Increment Compliance, Annual Averaging Period-SO_2," "Continental Cement Hannibal-Missouri Increment Compliance, 24-hour Averaging Period-SO_2," and "Continental Cement Hannibal, Missouri Increment Compliance, 3-Hour Averaging Period-SO_2," respectively.

A large portion of the elevated SO_2 concentrations occurred to west and southwest of the Continental Cement facility in Ralls County, Missouri. The maximum impacts appear to be the result of emissions from two differing Central Stone facilities. A review of the model output indicates that a portion of the elevated concentrations may be occurring at onsite receptors.

PM_{10}

To show compliance with the increment for PM_{10} the facility must demonstrate that its impact will be below 30 μg/m^3 on a 24-hour basis and 17 μg/m^3 on an annual basis. The results from the Department's Air Pollution Control Program verification run were used to evaluate compliance with the PM_{10} standards and are contained in Appendix I Table 4 entitled "Continental Cement Hannibal, Missouri-Increment Compliance Determination-PM_{10}." These results indicated that several violations of the PM_{10} standard would occur with a maximum annual concentration of 409.23 μg/m^3 and a 24-hour maximum of 5706.093 μg/m^3. Both concentrations include interactive source impacts for the 24-hour and annual averaging periods. The interactive sources account for the impact of expansion on air quality within the region.

According to EPA guidance, Continental Cement must demonstrate that they do not have a significant impact at any violating receptor regardless of where it is located. If it can be demonstrated that Continental Cement has insignificant impacts at violating receptors (at the time of the predicted violation), approval of the PM_{10} analysis can be provided. Appendix I, Tables 5 and 6, entitled "Continental Cement Hannibal, Missouri-PM_{10} Exceedance Receptors vs. First High Impacts-24-Hour" and "Continental Cement Hannibal, Missouri-PM_{10} Exceedance Receptors vs. First High Impacts-Annual" summarize the impact Continental Cement has on each receptor in violation of the PM_{10} standard. On an annual and 24-hour basis, Continental Cement did not have a significant impact at any violating receptors.

Additionally, as noted in Section VII, several stack/receptor combinations were flagged as locations where concentrations were not predicted due to the presence of a cavity wake zone based upon the algorithms contained within the ISCST3 dispersion model. Appendix E, Table 4 entitled "Continental Cement-Hannibal, Missouri PM_{10} Cavity Wake Zone Evaluation" summarizes the results obtained from the SCREEN3 dispersion model. With the exception of SH5, all of the stacks/receptor combinations identified by the ISCST3 model fall outside the cavity zone calculated by the SCREEN3 model. SH5 is predicted to have a maximum 24-hour concentration of 17.72 μg/m^3 when the stack is on the downwind side of the building with flow along the shortest side of the building at receptor (644901, 4393499). In reviewing the stack/receptor configuration, if the flow is parallel to the short side of the building, the cavity would not overlap the receptor in question. Please refer to Appendix E, Figure 5 entitled "Continental Cement-Hannibal, Missouri Cavity Wake Zone Stack/Receptor Configuration". As such, the concentration predicted for the longest side of the building, 8.72 μg/m^3 was used for compliance purposes on a 24-hour basis. The concentration included in determining the annual impact is 1.744 μg/m^3. Using the SCREEN3 output the maximum concentration predicted at receptor (644901, 4393499) is 17.16 μg/m^3 on a 24-hour basis. For the annual averaging period, the modeled concentration was –3.36218 μg/m^3. The inclusion of the SCREEN3 result maintains an ambient impact below zero.

For the remaining stack/receptor combinations, the results obtained from the screening model indicate that no additional ambient impact should be included at those receptors identified as located within a cavity wake zone as described by the ISCST3 dispersion model. This is because none of the receptors falls within the cavity predicted by the SCREEN3 model.

The PM_{10} output generated from the ISCST3 dispersion model is graphically in Appendix I, Figure's 4 and 5 entitled, "Continental Cement Hannibal, Missouri-Increment Compliance, Annual Averaging Period-PM_{10}" and "Continental Cement Hannibal, Missouri-Increment Compliance, 24-hour Averaging Period-PM_{10}."

Several areas with elevated PM_{10} concentrations are evident and occurred within the city limits of Hannibal, southwest, southeast and north northwest of the Continental Cement facility. The maximum impacts appear to be the result of emissions from several existing sources. A review of the model output indicates that a portion of the elevated concentrations may be occurring at onsite receptors.

XIII. HAPs Modeling

A Risk Assessment Level (RAL) compliance demonstration is required for each pollutant in question as required by the permit granting authority. Under current Air Pollution Control guidelines, a facility must submit an air quality analysis for all emission points within a facility when a refined analysis is required. This requirement was introduced to ensure that the applicable RAL is not violated near a facility since background concentrations are not a required component of a refined HAPs analysis. Background concentrations are not currently required because they are virtually unknown from most HAPs, thereby, making a background assessment impossible.

Appendix J, Table 1, entitled "Continental Cement Hannibal, Missouri-RAL Results" outlines the HAPs that will be emitted during the operation of the proposed facility and their subsequent impact. Please note, the determination of RAL compliance varies depending on the pollutant modeled due to differences in procedure when determining cancer rate incidences based upon populations. A portion of the RALs can be exceeded up to ten times the standard provided the cancer rate index was based upon a risk of 1 in 100,000. None of the HAPs exceed the RALs provided by the Department's Air Pollution Control Program. As such, an evaluation of the data used to derive the RAL was unnecessary and no further evaluation is warranted.

XIV. Additional Impact Analyses

In addition to performing an ambient air quality impact analysis, all PSD applicants must evaluate the impact the new source or modification will have on growth, soils, vegetation, and visibility impairment. The following paragraphs outline the procedures that were followed in an effort to address these additional impacts.

Plants, Soils & Animals

The maximum ambient concentrations emitted by a facility must be assessed in order to ensure that adverse impacts do not occur on plants, soils, and animals. Concentrations in excess of the screening levels outlined in the document entitled "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" would trigger the requirements of 40 CFR 52.21 (o) and (p). If predicted concentrations do not exceed the screening thresholds no further analysis is required.

The seven step process outlined in the above document was followed to screen Continental Cement's impact on plants, soils and animals. Each step of the process is described in the following paragraphs.

Steps 1 & 2

Steps 1 and 2 in the screening process address airborne pollutants and how exposures to plant tissue can adversely impact growth or cause tissue damage. In Step 1, the impact each pollutant may have was estimated using the ICST3 air quality model. Step 2 in the process compares the predicted ambient concentration to screening thresholds that represent the minimum concentration at which tissue injury or adverse growth effects are realized, Table 3.1 in the screening document.

Appendix K, Table 1 entitled "Continental Cement Hannibal, Missouri-Screening Concentrations for Exposure to Ambient Air Concentrations" summarizes the results obtained from the ISCST3 dispersion model. As suggested in the screening document, background concentrations were included in the results for comparison to the screening thresholds. For the soils, vegetation and animals analysis background concentrations include natural sources, nearby sources, and unidentified sources. That portion of the background concentration due natural and unidentified sources was obtained from monitoring data. Nearby sources were explicitly modeled based upon information contained within the Department's emission inventory.

As seen in the NAAQS and increment analyses described in previous sections, the ambient concentrations due to the interactive sources exceed the screening concentrations contained in Table 3.1 of the screening document. Comparatively speaking, the ambient impact from the proposed project at Continental Cement is minimal. Additionally, it is important to note that Continental Cement, under PSD guidelines, is not required to perform a full impact analysis for CO or NO_x.

A visual review of the ambient concentrations indicates that several areas with elevated concentrations are evident and occur throughout the modeling domain. The maximum impacts appear to be the result of emissions from several existing sources. A review of the model output indicates that a portion of the elevated concentrations may be occurring at onsite receptors. Given that the impact from Continental Cement is minimal, additional screening for the criteria pollutants was deemed unnecessary. Particularly in light of the fact that Continental Cement does not significantly impact any violating receptors that were identified during the NAAQS and increment reviews.

In addition to reviewing NO_2, SO_2 and O_3 on an individual basis, the screening document indicates that the impact of synergy should be evaluated. Mixtures of gases in the atmosphere may lead to vegetative damage and the screening values in Table 3.3 serve as an indicator of potential harm. Appendix K, Table 2 entitled "Continental Cement

Hannibal, Missouri-Synergism's of Gaseous Pollutants (Plants)" summarizes the potential impact from the proposed modification from O_3, NO_x and SO_2. Given the complex chemistry involved in ozone formation, modeled concentrations for ozone are not available. All ozone concentrations are based upon monitored data obtained from the Quincy, Illinois ozone site. During pre-application discussions, the Department's Air Pollution Control Program allowed Continental Cement to declare this site as a representative site for preconstruction monitoring. Based upon the impact from the modification, an adverse impact due to synergy is unlikely. Four-hour concentrations for ozone were not available from the State of Illinois.

Step 3

Step 3 in the seven step screening process addresses the impact air pollution has on plants and animals once the material is deposited and consequently becomes available for uptake by plants. This screen assumes that all of the deposited material is soluble and available for uptake. For each trace element emitted by Continental Cement, the concentration in the soil was calculated from the maximum annual average concentration predicted by the dispersion model. The results of this analysis are contained in Appendix K, Table 3, entitled "Continental Cement Hannibal, Missouri-Deposition of Trace Elements in Soil Concentrations." For those pollutants that exceed the screening concentrations, the background concentrations from Appendix C of the screening document in and of themselves result in adverse impacts. Given that the background information was not obtained from a local monitoring network, the screen was conducted without considering background concentrations. Based upon Continental Cement's impact alone, none of the trace elements exceeds the concentrations outlined in Table 3.4 of the screening document.

Step 4

The next step in the process is to compare the increase in concentration in the soil to the existing endogenous concentration. This information is used as a supportive indicator for Step 6 and is not used to show compliance. Appendix K, Table 4, "Continental Cement Company Hannibal, Missouri-Increase Over Endogenous Soil Concentration" summarizes the results obtained form this analysis. For those pollutants that exceed a 10% increase over endogenous soil concentrations, the background concentrations from Appendix C in and of themselves result in adverse impacts. Given that the background information was not obtained from a local monitoring network, the screen was conducted without considering background concentrations. The impact from Continental Cement alone does not result in more than a 10% increase in endogenous soil concentrations.

Step 5

In Step 5 the amount of the trace element that could potentially be taken up by plants is calculated and compared to the recommended plant to soil concentration ratio. Appendix K, Table 5, entitled "Continental Cement Company Hannibal, Missouri-Potential Concentrations in Plant Tissue" summarizes the results obtained from ISCST3 dispersion model. This analysis will be used to determine if all applicable thresholds are being met.

Step 6
The concentrations predicted in Step 3 and Step 5 are compared to the screening concentrations in Tables 3.4 and 3.7 in the screening document. The first table compares predicted impacts to the screening concentrations for exposure of vegetation to concentrations in the soil and plant tissues. The second table is used to evaluate the impact trace elements have on the dietary systems of animals and when dietary concentrations become toxic. All of the trace elements, based upon Continental Cement's impact alone are below the screening thresholds. Appendix K, Table 6, entitled "Continental Cement Hannibal, Missouri- Screen for Potential Adverse Impacts from Trace Elements" summarizes the results of this analysis.

Step 7
The last step in this process considers the effect of solubility on the ability of plants to uptake trace elements. All of the previous steps assumed that 100% of deposited material is available to a plant for uptake, however, this is not likely to occur in reality. This step is strictly a supportive indicator that looks at the possible effect that reduced solubility would have on predicted concentrations. Step 7 was not performed because the screening levels in Step 6 were not exceeded.

In addition to performing the seven step screening process outlined above, one additional analysis was performed comparing the proposed NO_x and SO_2 emissions to the criteria outlined in the document entitled "Air Quality Criteria for Oxides of Nitrogen, Summary of Vegetation Impacts"

Preliminary investigations indicate that short term exposure to elevated NO_x concentrations alone can cause damage to some sensitive plant species and crops. Table 1 in the above referenced document outlines the minimum concentration to which sensitive, intermediate, and tolerate plants can be exposed prior to receiving 5% injury to their foliage for various averaging times. Based upon this information, elevated NO_x concentrations over a short time frame can cause more damage than low NO_x concentrations over an extended period of time. Appendix K, Table 7, entitled "Continental Cement Company Hannibal, Missouri-Screen for Adverse Impacts from NO_x Emissions" summarizes the results of this analysis. The current version of the ISCST3 dispersion model does not allow the user to calculate concentrations less than one hour. As such, a comparison between the half-hour tolerance levels could not be made. However, all of the calculated NO_x concentrations fall below the criteria outlined in the guidance document for the remaining averaging times.

The guidance goes on to site recent studies that have indicated that synergy between two or more criteria pollutants can cause vegetative damage at lower concentrations than from a higher exposure to a single pollutant. Specifically mentioned in the documentation is the synergy that occurs between NO_x and SO_2 emissions. Comparison to a specific exposure level is not possible in this instance because the guidance document does not outline concentrations and exposure times where synergy may cause the most harmful impacts to plant foliage and crops. As such, a comparison between the maximum NO_x and SO_2 concentrations for a 4-hour exposure period were compared to a threshold of .1

parts per million (188 $\mu g/m^3$ of NO_x, 261 $\mu g/m^3$ of SO_2). Appendix K, Table 8 entitled "Continental Cement Company Hannibal, Missouri-Screen for Adverse Impacts from Synergy between NO_x and SO_2 Emissions" outlines the results obtained from the ISCST3 dispersion model. The NO_x and SO_2 impacts are less than half the 0.1 part per million threshold level. Due to the lack of information available regarding synergy between criteria pollutants and potential vegetative damage no conclusive impact could be assessed based upon the model results, however, given the low concentrations predicted it is unlikely that the net emissions increase will result in adverse impacts.

Class II Visibility Impacts

The PSD regulations require the applicant to provide an assessment of the plume visual impact that is likely to occur due to the proposed new source or modification. This analysis is based upon impacts within the significant impact area of the new source or modification and is separate from the Class I analysis that is required for sources within 300 kilometers of a Class I area.

Initially, it must be determined what, if any, scenic vistas, airports, or other sensitive areas are located within the significant impact area of the new source or modification. PM_{10} is the only PSD pollutant that exceeds the significant emission rates (VISCREEN does not allow for the input of SO_2). In order to determine the potential to cause degradation of visibility within the region from the proposed project, staff included the potential NO_x emissions that will be emitted from the new kiln even though this pollutant did not trigger a PSD review.

Five sensitive areas were identified: Hannibal Airport, Mark Twain Boyhood Home, Mark Twain Lake and State Park, Upper Mississippi Conservation Area and the Ted Shanks/Edward Anderson Conservation Area. Appendix L, Figure 1 entitled "Continental Cement Hannibal, Missouri Sensitive Areas Under Review" graphically depicts the location of each sensitive area that was evaluated using the screening techniques recommended by the Environmental Protection Agency in its draft document entitled "New Source Review Workshop Manual".

VISCREEN, the plume visual impact screening model, was used to determine the impact on visibility within each sensitive area defined above. As recommended, a Level 1 screening analysis was performed using the worst case meteorological conditions and a plume/observer relationship that places the plume adjacent to the observer. It is important to note that VISCREEN requires the user to input primary particulate matter, oxides of nitrogen, primary nitrogen dioxide, soot, and primary sulfate. PM_{10} and NOx emissions were included in the assessment of visual impacts. Appendix L, Table 1 "Continental Cement Level 1 VISCREEN Analysis " contains the results obtained from the Level 1 screening analysis. The visual impacts predicted by the VISCREEN model indicate that the plume visual impact screening criteria are exceeded for all five of the sensitive areas. As such, a Level 2 analysis was performed.

Unlike the Level 1 analysis, the Level 2 screening analysis requires an evaluation of both the frequency and distribution of wind speed and direction in order to determine if the plume will remain cohesive as it travels towards the observer located within the area of interest. If the plume is dispersed due to convective activity, it is unlikely that any discoloration of the atmosphere will be visible.

For the Continental Cement Level 2 analysis, the Department's Air Pollution Control Program constructed a meteorological database that included the joint frequency of occurrence of wind speed, wind direction, and stability class. Once the meteorological data was tabulated, maps of the source/observer relationship were reviewed so that the wind sector that transports emissions closest to the observer could be determined. For each critical wind direction, the worst case dispersion characteristics were ranked in order of severity along with the frequency of occurrence. Appendix L, Tables 2-6, entitled "Continental Cement Missouri Worst Case Meteorological Conditions for Plume Visual Impact Calculations" summarizes the worst case meteorological conditions, transport time associated with each condition and the frequency of occurrence for each sensitive area for each meteorological period included in the AAQIA. The worst case stability class and wind speed varied from area to area and were based upon the one percentile meteorology identified in the frequency distribution tables. The one percentile meteorology occurs when the most severe meteorological conditions are coupled with other factors that contribute to maximum plume visual impacts.

Appendix L, Table 7, "Continental Cement Level 2 VISCREEN Analysis", summarize the results obtained from the Level 2 screening analysis using the one percentile meteorological conditions for each of the five sensitive areas. Visible impacts continued to be likely based upon the VISCREEN default particle size distributions and worst case plume/observer geometries. It should be noted that the worst case meteorological conditions occurred during the late evening and early morning hours when wind speeds decrease and atmospheric stability increases. The plume would not be visible during the nighttime hours and an assessment using typical nighttime conditions will yield conservative results. The Air Quality Modeling Unit acknowledges that these conditions may continue to occur immediately after sunrise, however, the likelihood that they would persist for multiple hours after sunrise is small.

Additionally, the criteria used to determine plume visual impacts within the VISCREEN modeling system were developed to protect Class I areas from harm and were not designed to determine if visibility degradation within Class II areas is likely. As such, the prediction of Class I impacts may or may not indicate an adverse impact within a Class II region.

A more refined analysis, which incorporates particle size distributions, plume overlap, and different geometries, could lead to improved Class II visibility results. The consideration of a more sophisticated model could also lead to improved visibility predictions.

Growth

Based upon draft guidance from the EPA, the growth analysis should address the growth that comes about as the result of the proposed facility. This assessment should include an evaluation of air quality impacts related to any construction, commercial, industrial, or other growth that occurs.

Current growth estimates from the region indicate that both direct and indirect impacts on air quality are anticipated to be minimal based upon the analysis supplied by STS Consultants. As such, the inclusion of secondary emissions was not considered in the AAQIA for Continental Cement.

XV. Class I Area Impact

Under PSD guidelines, certain scenic areas throughout the United States have been designated as regions that must be protected due to their natural, scenic, recreational, or historic value. These regions are defined as Class I areas. Any source proposing to locate within 300 kilometers of a protected region must evaluate its impact on existing increment and visibility within the Class I area's property boundary. Based upon the UTM coordinates supplied by STS Consultants, Continental Cement is within 298 kilometers of the Mingo Wildlife Refuge. Given that the facility is removing its existing kiln the modification is unlikely to cause adverse impacts for such a large distance, as such a Class I analysis was not required.

XVI. Recommendations

The AAQIA submitted in support of the Continental Cement PSD application is complete. The following recommendations should be incorporated into the PSD permit as special conditions. Failure to do so may invalidate the results obtained from the AAQIA.

1. The point source emission rates contained in Appendix A Table 1 should not be exceeded.
2. The volume source emission rates contained in Appendix A Table 2 should not be exceeded.
3. The area source emission rates contained in Appendix A Table 3 should not be exceeded.
4. Emissions from the kiln should not exceed the following:
   a. 71 Lbs. PM_{10}/ hour on a 24-hour and annual basis,
   b. 607.24 Lbs. CO/hour on a 1-hour and 8-hour basis,
   c. 550.01 Lbs. SO_2/hour on a 3-hour basis,
   d. 265.40 Lbs. SO_2/hour on a 24-hour and annual basis.
5. Operations at the Saverton Quarry should not exceed 17 hours of operation per day.
6. Appendix A, Table 4 summarizes the emission releases that will experience reductions due to removal, control, or voluntary restriction. The facility will be required to reduce emissions through the installation of control equipment, reduced operating levels, or equipment removal.

7. The following emission sources must be removed or rendered inoperable prior to the start-up of the proposed modification:
    a. KP-01, the existing cement kiln,
    b. CM-01, CM01A, CM2, CM2A, existing clinker cooler and ancillary equipment,
    c. RM-15, secondary crusher
    d. CG7, CG9B, CG9D, CG14, CG14A-D, CG16, natural gypsum handling and storage.

8. The property boundary declared in the Continental Cement modeling analysis must preclude access in a manner that prohibits entrance by unauthorized individuals.

Attachments

c: Dawn Froning, Air Quality Analysis Section, APCP
Richard Daye, U.S. Environmental Protection Agency Region VII